

Message Text

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PAGE 01 TOKYO 15133 220740Z
ACTION OES-09

INFO OCT-01 EA-10 ISO-00 SOE-02 INR-10 AID-05 CEA-01
CIAE-00 COME-00 DODE-00 EB-08 H-01 INT-05 L-03
NSAE-00 NSC-05 OMB-01 PM-05 ICA-11 SP-02 SS-15
STR-07 TRSE-00 ACDA-12 NRC-05 SAS-02 NSF-01 NAS-01
/122 W

-----071930 220744Z /11

R 220732Z AUG 78
FM AMEMBASSY TOKYO
TO SECSTATE WASHDC 0572
INFO DOE WASHDC
DOE GERMANTOWN MD

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FOR OES/NET; INR/DDC/OIL

E.O. 11652: N/A
TAGS: TECH, ENRG, JA
SUBJECT: JAPANESE RESEARCH ON LASER INDUCED
THERMONUCLEAR FUSION

THE FOLLOWING UNCLASSIFIED SUMMARY OF FUSION RESEARCH
IN JAPAN, BASED ON JAPANESE DOCUMENTS, WAS PREPARED BY
THE USASTCFEO, YOKOTA BASE:

QTE. THE INSTITUTE OF LASER ENGINEERING OF OSAKA
UNIVERSITY AND THE INSTITUTE OF PLASMA PHYSICS OF NAGOYA
UNIVERSITY ARE ENGAGED IN COOPERATIVE RESEARCH ON LASER
FUSION. THE PROGRAM INVOLVES EXPERIMENTAL DETERMINATION
OF EXPERIMENTAL PARAMETERS AND COMPUTER SIMULATIONS OF
THE LASER IMPLOSION PROCESS. SEVERAL EXPERIMENTS HAVE
USED THE GLASS LASER "GEKKO II." THE OSCILLATOR WAS A
YAG LASER MODE-LOCKED BY SATURABLE DYE, WHICH WAS
FOLLOWED BY NINE ROD TYPE AMPLIFIERS. THE DIAMETER OF
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PAGE 02 TOKYO 15133 220740Z

THE FINAL ROD WAS 80 MM. THE OUTPUT ENERGY WAS TYPICALLY
15 J PER BEAM, AND THE PULSE WIDTH 30 PSEC TO 200 PSEC.
THE MAXIMUM POWER DENSITY WAS OVER 10 TO THE 16TH POWER
WATTS PER SQUARE CENTIMETER ON THE TARGET. A PHYSICAL
SIMULATION OF COMPRESSION USING THIS LASER AND MULTILAYER
THIN FILM TARGETS WAS PERFORMED TO INVESTIGATE ENERGY
TRANSPORT AND TO OBTAIN PARAMETERS FOR PELLET DESIGN.

GEKKO II WAS ALSO USED IN A SPHERICAL COMPRESSION
EXPERIMENT OF GLASS MICROBALLOON PELLETS PRESSURIZED
BY DEUTERIUM GAS. THE DENSITY SCALE LENGTH UNDER THE
LASER IRRADIATION WAS ESTIMATED TO BE 1 OR 2 MICRONS.
THE THICKNESS OF WALL YIELDING THE MAXIMUM NEUTRON FLUX
WAS ABOUT 0.6 MICRON. EXPERIMENTS WERE ALSO PERFORMED
WITH A CARBON LASER, "LEKKO I." AN OUTPUT ENERGY OF UP
TO 100 J IN 2 NSEC WAS AVAILABLE. THE MAXIMUM POWER
DENSITY ON THE TARGET WAS ABOUT 10 TO THE 13TH POWER WATTS
PER SQUARE CENTIMETER. SINCE THE THRESHOLDS FOR VARIOUS
NON-LINEAR PROCESSES ARE CONSIDERABLY LOWER FOR LONGER
WAVELENGTH LASER RADIATION, A SCALING ANALYSIS OF THE
LEKKO I EXPERIMENT WAS DONE TO YIELD MORE DETAILED
INFORMATION ABOUT THE INTERACTION PHYSICS. WITH RESPECT
TO THE LASER POWER DENSITY, THREE DIFFERENT ABSORPTION
REGIONS WERE OBSERVED: THE CLASSICAL ABSORPTION, THE
PARAMETRIC DECAY INSTABILITY, AND THE RESONANT
ABSORPTION. THE RESONANT ABSORPTION WAS CLEARLY
INDICATED BY THE SPATIAL DIRECTIVITY OF THE SCATTERED
LIGHT DUE TO THE POLARIZATION OF THE LIGHT. IN THIS
POWER DENSITY REGION, TOTAL ENERGY ABSORPTION MAY BE AS
HIGH AS 80 PER CENT. COMPUTER SIMULATIONS HAVE BEEN
COMPLETED WHICH ALLOW A GOOD DESCRIPTION OF THE
DEFLAGRATION WAVE, THE TIME VARIATION OF THE IMPLOSION
STRUCTURE, AND THE DEPENDENCE OF COMPRESSION EFFICIENCY
ON LASER WAVELENGTH AND POWER DENSITY. UNQTE.
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PAGE 03 TOKYO 15133 220740Z

MANSFIELD

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NNN

Message Attributes

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